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EXAMINER

CHOU, ANDREW Y

ART UNIT	PAPER NUMBER
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2192

MAIL DATE	DELIVERY MODE
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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/734,959

Applicant(s)

NGAI ET AL.

Examiner

Andrew Y. Chou

Art Unit

2192

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 April 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on _____ is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This action is responsive to the application filed on 04/18/2007.
2. Claims 1 and 32 have been amended.
3. Claims 1-32 are still pending.

Response to Arguments

4. Applicant's arguments with respect to claims rejection have been considered but are moot in view of the new grounds of rejection. See Dubey et al. US 5,812,811 (hereinafter Dubey) of record as applied below.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1--32 are rejected under 35 U.S.C. 102(b) as being anticipated by Dubey et al. US 5,812,811 (hereinafter Dubey).

Claim 1:

Dubey discloses a method of compiling a program comprising:

identifying a set of speculative parallel thread candidates (see for example column 4, lines 50-55);

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determining cost values for at least some of the speculative parallel thread candidates (see for example column 2, lines 20-40);

selecting a set of speculative parallel threads from the set of speculative parallel thread candidates based on the cost values (see for example column 2, lines 20-40); and generating program code based on the set of speculative parallel threads (see for example column 4, lines 55-59, "Fork-Suspend instructions", and associated text).

Claim 2:

Dubey further discloses a method as defined in claim 1 wherein identifying the set of speculative parallel thread candidates comprises identifying program regions (see for example FIG. 2A, item 210, "FIND FORK POINTS", and associated text)

Claim 3:

Dubey further discloses a method as defined in claim 1 wherein at least one of the speculative parallel thread candidates comprises at least one program region (see for example column 4, lines 50-59, and associated text).

Claim 4:

Dubey further discloses a method as defined in claim 1 wherein at least one of the speculative parallel threads comprises at least one program region (see for example column 4, lines 50-59, and associated text).

Claim 5:

Dubey further discloses a method as defined in claim 1 wherein identifying the set of speculative parallel thread candidates comprises identifying program loops (see for example column 24, lines 13-29, "5. Parallel Execution of Loop Iterations").

Claim 6:

Dubey further discloses a method as defined in claim 1 wherein at least one of the speculative parallel thread candidates comprises a program loop (see for example column 24, lines 13-29, "5. Parallel Execution of Loop Iterations").

Claim 7:

Dubey further discloses a method as defined in claim 1 wherein at least one of the speculative parallel threads comprises a program loop (see for example column 24, lines 13-29, "5. Parallel Execution of Loop Iterations").

Claim 8:

Dubey further discloses a method as defined in claim 1 wherein identifying the set of speculative parallel thread candidates comprises identifying a main thread (see for example column 15, lines 45-50, "8. Execute main thread", and associated text).

Claim 9:

Dubey further discloses a method as defined in claim 8 wherein the main thread comprises a current iteration of a program loop, and the speculative parallel thread candidate comprises a next iteration of the same program loop (see for example column 15, lines 45-50, "8. Execute main thread", and associated text).

Claim 10:

Dubey further discloses a method as defined in claim 8 wherein the main thread comprises a current iteration of a program loop, and the speculative parallel thread comprises a next iteration of the same program (see for example column 15, lines 45-50, "8. Execute main thread", and associated text).

Claim 11:

Dubey further discloses a method as defined in claim 1 wherein the cost value is a misspeculation cost (see for example column 2, lines 20-40).

Claim 12:

Dubey further discloses a method as defined in claim 11 wherein determining the misspeculation cost comprises:

identifying a data dependency in the speculative parallel thread candidate (see for example column 9, lines 1-10);

determining, for the data dependency, a likelihood that a dependency violation will occur; and determining an amount of computation required to recover from the data dependency violation (see for example column 7, lines 10-20, FIG. 1A, block 140, and associated text).

Claim 13:

Dubey further discloses a method as defined in claim 1 further comprising determining at least one of the following for at least one of the speculative parallel thread candidates:

a size of the speculative parallel thread candidate; and a likelihood representative of the speculative parallel thread candidate (see for example columns 22 line 60- column 23 lines 35, "3. Speculating data dependence across control independent blocks", and associated text).

Claim 14:

Dubey further discloses a method as defined in claim 1 wherein at least one of the

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speculative parallel thread candidates is transformed prior to determining the cost value for the at least one of the speculative parallel thread candidates (see for example column 14, lines 50-65, "1. Find fork points", and associated text).

Claim 15:

Dubey further discloses a method as defined in claim 14 wherein the at least one of the speculative parallel thread candidates is transformed by a code reordering (see for example column 14, lines 50-65, "1. Find fork points", and associated text).

Claim 16:

Dubey further discloses a method as defined in claim 14 further comprising determining at least one of the following for at least one of the speculative parallel thread candidates:

a size of the speculative parallel thread candidate;

a likelihood representative of the speculative parallel thread candidate (see for example column 8 lines 60-65, "1. Fork", and associated text); and

a description of the transformation performed on the speculative parallel thread candidate.

Claim 17:

Nair further discloses a method as defined in claim 1 wherein at least one of the speculative parallel threads is transformed prior to code generation (see for example column 8 lines 60-65, "1. Fork", and associated text).

Claim 18:

Nair further discloses a method as described in claim 17 wherein the at least one of the

speculative parallel threads is transformed by code reordering ((see for example column 8 lines 60-65, "1. Fork", and associated text).

Claim 19:

This is the article version of the claimed method discussed above (Claim 1), wherein all claim limitations have been addressed and/or covered in cited areas as set forth above.

Thus, accordingly, these claims are also anticipated by Dubey.

Claim 20:

This is the article version of the claimed method discussed above (Claim 11), wherein all claim limitations have been addressed and/or covered in cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Dubey.

Claim 21:

This is the article version of the claimed method discussed above (Claim 12), wherein all claim limitations have been addressed and/or covered in cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Dubey.

Claim 22:

This is the article version of the claimed method discussed above (Claim 13), wherein all claim limitations have been addressed and/or covered in cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Dubey.

Claim 23:

This is the article version of the claimed method discussed above (Claim 14), wherein all claim limitations have been addressed and/or covered in cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Dubey.

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Claim 24:

Dubey discloses an apparatus (see for example FIG. 1A, and related text) to compile a program comprising:

a candidate identifier to identify a set of speculative parallel thread candidates (see for example FIG. 1A, item 112, and related text);

a metric estimator to determine a cost value for at least one of the speculative parallel thread candidates (see for example FIG. 1A, item 130, Thread Management Unit, and related text);

a speculative parallel thread selector to select a set of speculative parallel threads from the set of speculative parallel thread candidates based on the cost values (see for example FIG. 1A, item 130, Thread Management Unit, and related text); and

a code generator to generate program code based on the set of speculative parallel threads (see for example column 4, lines 55-59, "Fork-Suspend instructions", and associated text).

Claim 25:

Dubey further discloses a apparatus as defined in claim 24 wherein the candidate identifier comprises a region identifier to identify program regions (see for example FIG. 1A, item 150, "Scheduler", and related text).

Claim 26:

Dubey further discloses a apparatus as defined in claim 24 wherein the candidate identifier comprises a loop identifier to identify program loops (see for example column 24, lines 13-29, "5. Parallel Execution of Loop Iterations").

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Claim 27:

Dubey further discloses a apparatus as defined in claim 24 wherein the candidate identifier comprises a candidate selector to select a first one of a program region and a program loop iteration to execute in a main thread, and to select a second one of a program region and a program loop iteration to execute in a speculative parallel thread (see for example FIG. 1A, item 130, Thread Management Unit, and related text).

Claim 28:

Dubey further discloses a apparatus as defined in claim 24 wherein the metric estimator determines a misspeculation cost (see for example column 2, lines 20-40).

Claim 29:

Dubey further discloses a apparatus as defined in claim 24 wherein the metric estimator comprises:

a data dependency identifier to identify a data dependency in the speculative parallel thread candidate (see for example column 4, lines 50-55);

a likelihood evaluator to determine a likelihood that a dependency violation will occur (see for example column 7, lines 10-20, FIG. 1A, block 140, and associated text); and

a recovery size calculator to determine an amount of computation required to recover from the data dependency violation (see for example FIG. 1A, item 130, "Thread Management Unit", and related text).

Claim 30:

Dubey further discloses an apparatus as defined in claim 24 wherein the candidate

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identifier determines at least one of the following for at least one of the speculative parallel thread candidates:

a size of the speculative parallel thread candidate;

and a likelihood representative of the speculative parallel thread candidate (see for example column 7, lines 10-20, FIG. 1A, block 140, and associated text).

Claim 31:

Dubey discloses a system (see for example FIG. 1A, and related text) to compile a program comprising:

a candidate identifier to identify a set of speculative parallel thread candidates (see for example FIG. 1A, item 112, and related text);

a metric estimator to determine a cost value for at least one of the speculative parallel thread candidates (see for example FIG. 1A, item 130, Thread Management Unit, and related text);

a speculative parallel thread selector to select a set of speculative parallel threads from the set of speculative parallel thread candidates based on the cost values (see for example FIG. 1A, item 130, Thread Management Unit, and related text); and

a code generator to generate program code based on the set of speculative parallel threads (see for example column 4, lines 55-59, "Fork-Suspend instructions", and associated text).

Claim 32:

Dubey further discloses a system as define in claim 31 wherein the metric estimator comprises:

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a data dependency identifier to identify a data dependency in the speculative parallel thread candidate (see for example column 4, lines 50-55);

a likelihood evaluator to determine a likelihood that a dependency violation will occur (see for example column 7, lines 10-20, FIG. 1A, block 140, and associated text); and

a recovery size calculator to determine an amount of computation required to recover from the data dependency violation (see for example FIG. 1A, item 130, "Thread Management Unit", and related text).

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew Y. Chou whose telephone number is (571) 272-6829. The examiner can normally be reached on Monday-Friday, 8:00 am – 4:30 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tuan Q. Dam, can be reached on (571) 272-3695.

The fax phone number for the organization where this application or proceeding is assigned is (571) 273 8300.

Any inquiry of a general nature of relating to the status of this application or proceeding should be directed to the TC 2100 Group receptionist whose telephone number is (571) 272 2100.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll free).

AYC

A handwritten signature in black ink, appearing to read 'Tuan Dam', with a stylized flourish at the end.

TUAN DAM
SUPERVISORY PATENT EXAMINER